Maternal Cannabis Use and Childhood Development

Harlie E. Visser, SRNA, Danielle O. Smith, SRNA, and Taylor B. Crum, SRNA

Department of Nurse Anesthesia, AdventHealth University

DNAP893b: Evidence-Based Practice Vb: Dissemination

Scholarly Chair: Dr. Jill Mason

February 18, 2024

Acknowledgements

Abstract

Fallacies surrounding gestational cannabis use are a growing concern throughout the obstetric population. Societal factors play a major role in influencing cannabis use as a method to alleviate symptoms such as nausea in early pregnancy. There is a gap in the literature regarding perinatal education and the psychological and physiological effects of in-utero exposure to cannabis. These identified risks ranged from behavioral transgressions to physical anomalies such as small for gestational age, ultimately supporting the need for enhanced education regarding gestational cannabis use. This social habit can significantly affect anesthetic management during the intrapartum phase and negatively impact pain and postoperative nausea and vomiting management. The purpose of this innovation was to assess maternal knowledge on gestational cannabis use and the effects on childhood development in parturient participants attending an in-person educational class at the Osceola Pregnancy Center in Kissimmee, Florida (FL). Implementation of a 20-minute PowerPoint educational session was conducted for parturient participants, and a face-validated pretest and posttest were electronically distributed. A non-identifying online platform, Microsoft Forms, was utilized to facilitate data collection. Data analysis utilized the Wilcoxon signed-rank test, yielding a p-value of 0.0002079 ($\alpha = 0.05$). These findings suggest a positive correlation between a community-based perinatal educational course and improved maternal knowledge. Evidence-based recommendations can be made for continued community educational outreach initiatives to raise patient and provider awareness on the growing topic.

Table of Contents

List of Figures and Tables

Maternal Cannabis Use and Childhood Development

As perceptions of cannabis evolve, a lack of maternal education on adverse effects related to childhood outcomes has been noted in the literature (Barbosa-Leiker et al., 2020; Weisbeck et al., 2020). Expecting mothers' skewed perceptions have deemed cannabis use relatively safe, catapulting the need for perinatal education reform as this social habit presents complex intrapartum obstacles to healthcare providers (Bayrampour et al., 2019; Pike et al., 2021; Weisbeck et al., 2020). Gestational cannabis use may result in intrapartum challenges requiring certified registered nurse anesthetists (CRNAs) to alter care in the obstetric population (Daha et al., 2020; Rodriguez et al., 2019). The purpose of this project was to educate parturient participants on the risks associated with gestational cannabis use.

Significance & Background of Clinical Problem

There is a steady increase in cannabis consumption among pregnant and non-pregnant women of childbearing age (Chang et al., 2019). Cannabis is used in this population for a multitude of reasons, including recreational purposes and symptom alleviation of hyperemesis gravidarum (Mark et al., 2017; Pike et al., 2021; Weisbeck et al., 2020). As the legalization and accessibility of cannabis expands in the United States, misconceptions on its effects are skewed, influencing its unconventional use to treat pregnancy-related symptoms (Brown et al., 2017; Mark et al., 2017; Pike et al., 2021). Perinatal cannabis usage has markedly increased from 3.4% in 2002 to 8.17% since the 2020 pandemic, hence the need for perinatal education on this topic (Young-Wolff et al., 2021).

Acute adverse incidences are associated with maternal cannabis use on the infant, such as preterm births, small for gestational age (SGA), and shorter infant lengths (Fergusson et al., 2002; Nguyen & Harley, 2021; Rodriguez et al., 2019; Warshak et al., 2015). Along with these

physiological effects, higher incidences of psychological disorders such as aggression, delinquent behavior, and shorter attention spans have also been tied to maternal cannabis use (Day et al., 2011; Marroun et al., 2011; Paul et al., 2021). An emotional burden is put on families caring for children that developed psychological disorders secondary to in-utero cannabis exposure, ultimately requiring additional care and supervision. (Day et al., 2011; Marroun et al., 2011; Paul et al., 2021). A financial burden is put on the healthcare system and families of cannabis-exposed infants as they often require a higher acuity level of care on delivery (Gunn et al., 2016; Warshak et al., 2015). The average daily cost of a neonatal intensive care unit (NICU) admission is $2,900 compared to $800 for a non-critical newborn stay; this puts an unexpected financial strain on these families (Cheah, 2019; Gunn et al., 2016; Warshak et al., 2015).

CRNAs are heavily involved in the obstetric community and offer services for labor induced pain management and anesthesia during cesarean births, as well as provide rescue measures to premature infants (American Association of Nurse Anesthesiology [AANA], 2020). Parturient patients that partake in cannabis use are at an increased risk for a cesarean delivery as opposed to nonusers, emphasizing a need for an adaptive obstetrical anesthetic plan (Sasso et al., 2021). Due to the increased risk for obstetric complications, parturients should be educated on the potential adverse outcomes that may warrant emergent interventions during delivery. Enhancing maternal knowledge on this topic will aid in informed decision making and decrease the risk of these unwarranted outcomes (Cohen et al., 2021; Gunn et al., 2016; Rodriguez et al., 2019; Warshak et al., 2015).

The American College of Obstetricians and Gynecologists (ACOG, 2018) recommends the cessation of cannabis use during pregnancy to reduce the risk of obstetric complications and adverse fetal outcomes. Risk factors associated with this behavior have a substantial impact on

the anesthetic management of the parturient patient, such as increased anesthetic requirements, poor pain control, and management of postoperative nausea and vomiting (PONV) (American Society of Anesthesiologists [ASA], 2020; Davidson et al., 2020; Horvath et al., 2019). Due to cannabis users having a higher metabolism, they are prone to requiring more anesthetic agents and analgesic requirements in the postoperative period to obtain an adequate level of comfort (Alexander & Joshi, 2019; Horvath et al., 2019; Wiseman et al., 2022). Chronic cannabis use causes the downregulation of CB-1 receptors and the accumulation of toxins, thus increasing the risk of developing cannabinoid hyperemesis syndrome. This occurrence hinders the ability to manage PONV appropriately and decreases the effectiveness of conventional antiemetic therapy (Davidson et al., 2020; Suhre et al., 2020). Considering all the known health risks precipitated by gestational cannabis use, anesthesia providers should prioritize perinatal education on this topic.

PICOT Evidence Review Questions

Two PICOT questions were formulated that guided the approach of the systematic review of the literature (Roush, 2019). The first question addressed the clinical problem: In adult pregnant women (P), how does gestational cannabinoid use (I) compared to cessation of cannabinoid use (C) influence the physical and psychological development of the child (O)? The second question addressed the clinical intervention: Among pregnant women attending an in-person course at the Osceola Pregnancy Care Center in Florida (P), does the implementation of a 20-minute (T) educational PowerPoint presentation regarding gestational cannabinoid use and its effects on childhood development (I) result in a difference in pretest and posttest knowledge (O)?

Search Strategy Results

The search strategy included online databases: CINAHL, PubMed, and Google Scholar. This resulted in 17,900 articles with 12 meeting inclusion criteria. After initial review of title

pages for topic relevance, 73 articles met criteria for abstract review. Abstracts were reviewed, 41 articles met inclusion criteria for maternal cannabis use, educational barriers, and offspring effects. After final article review, 12 studies consisting of systematic reviews and observational studies solely including cannabis use met criteria. Articles were eliminated that excluded cannabis use and polysubstance use. Key search terms included: *Cannabis* AND *physiological development* AND *adverse fetal outcomes* AND *education*. MESH terms included: *Cannabis, pregnancy, and psychological development*. The search limits were: English and peer-reviewed.

GRADE Criteria

The literature on gestational cannabis usage was evaluated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria (see Appendix A). Initially, the supporting body of evidence produced a GRADE level of moderate-3 as the literature mainly consisted of systematic reviews and observational studies. The GRADE level was then graded down as there were several limitations, such as methodological flaws and imprecision. The methodological flaws consistently included the use of self-reporting from the subjects. There were also wide confidence intervals and small sample sizes, resulting in imprecision. The GRADE level was decreased to low-2. The literature was graded up for the large magnitude of effect, as many of the studies showed a strong relationship between maternal cannabis usage and infant adverse effects. The final GRADE level of the supporting body of evidence is moderate-3. Overall, based on the moderate quality of evidence, a recommendation can be made for improvement within perinatal education on the effects of cannabis use.

Literature Review & Synthesis of Evidence

There is an association between the use of cannabis during pregnancy and long-standing physiological and psychological effects on childhood development (Daha et al., 2020; Gunn et

al., 2016). Societal misconceptions and the lack of maternal education influence mothers to engage in gestational cannabis use, causing potential harm in the development of the child (Chang et al., 2019; Pike et al., 2021). This literature review provided current evidence-based recommendations for the development of maternal education regarding in-utero cannabis exposure.

Physiological Effects

The use of maternal cannabis throughout pregnancy negatively impacts the physiological growth and development of the infant in various ways (Daha et al., 2020; Fergusson et al., 2002; Gunn et al., 2016; Nguyen & Harley, 2021; Rodriguez et al., 2019; Warshak et al., 2015). Exposure to gestational cannabis has been associated with the delivery of low birth weight (LBW) infants in comparison to non-users (Fergusson et al., 2002; Gunn et al., 2016; Nguyen & Harley, 2021) and also often results in infants who are SGA (Nguyen & Harley, 2021; Rodriguez et al., 2019; Warshak et al., 2015). The exposure of cannabis to infants in-utero throughout pregnancy has also been associated with a need for a higher acuity level of care for the infant due to the higher prevalence of preterm delivery, ultimately prompting a need for a NICU admission (Gunn et al., 2016; Nguyen & Harley, 2021; Rodriguez et al., 2019; Warshak et al., 2015).

Psychological Effects

Perinatal cannabis use is linked to adverse behavioral characteristics amongst children and adolescents (Day et al., 2011; Zammit et al., 2009). Evidence-based research supports the connection between in-utero cannabis exposure and the development of psychological disorders such as depression, aggression, and behavioral delinquency (Day et al., 2011; Marroun et al., 2011; Paul et al., 2021). Contributing factors associated with this conclusion include the quantity of cannabis consumed and the timeline of exposure to the substance during fetal development

(Daha et al., 2020; Day et al., 2011). Parental participants reported behavioral delinquencies that researchers connect to intrauterine cannabis exposure (Day et al., 2011; Zammit et al., 2009). Gestational cannabis use can lead to a short attention span, lower IQ, and sleep disturbances that hinder learning and academic achievement (Daha et al., 2020; Marroun et al., 2011; Paul et al., 2021).

Educational Barriers

Although the literature consistently suggests adverse effects on infants and children associated with gestational cannabis exposure, there is still an increase in the prevalence of its usage (U.S. Department of Health & Human Services, 2019). Many expecting mothers believe this behavior is relatively safe and causes no harm to the infant (Bayrampour et al., 2019; Pike et al., 2021; Weisbeck et al., 2020). Remarkably, 34-60% of cannabis users are likely to continue this practice throughout pregnancy as perceptions of its effects are skewed (ACOG, 2017). Suggestions to improve maternal education on gestational cannabis exposure have been made based on the body of supporting evidence of adverse effects on the infant (Gunn et al., 2016; Pike et al., 2021; Woodruff et al., 2021).

While there are several articles that support the adverse physiological and psychological effects on infants with maternal cannabis use during pregnancy, there is limited literature specifically analyzing perinatal education and cessation of gestational cannabis use. We developed and implemented a community-based educational opportunity for women of child-bearing age to evaluate maternal knowledge on the importance of cessation during pregnancy.

Theoretical Framework

The Plan-Do-Study-ACT (PDSA) cycle was utilized to guide this scholarly project (The W. Edwards Deming Institute, 2022). The PDSA cycle is a systematic quality improvement

process that focuses on change through an individual's ideas that are then put into practice (Reed et al., 2016; The W. Edwards Deming Institute, 2022). The overall goal of the PDSA cycle is to gain insight, identify the workability of an intervention in a specific setting, and then adjust to maintain sustainability (Reed et al., 2016; The W. Edwards Deming Institute, 2022). The chosen framework consists of a total of four phases that can be repeated as part of a continuous cycle for improvement and knowledge gain.

Applicability to Practice

The review of the literature revealed that mothers perceive cannabis as a natural substance; thus, it is believed to be less harmful in comparison to tobacco and other recreational drugs (Chang et al., 2019; Mark et al., 2017). This distorted perception proves there is an educational gap in mothers' understanding of the risk factors associated with gestational cannabis use and its effects on fetal development (Chang et al., 2019; Pike et al., 2021; Weisbeck et al., 2020). There is a need for a community-based health initiative that will educate women on the effects of cannabis use during pregnancy on infants and throughout childhood.

This scholarly project enhanced community awareness by creating a safe environment for perinatal education on cannabis use while promoting healthy lifestyle choices during pregnancy. This project provided evidence-based recommendations to promote cannabis cessation during pregnancy and improve maternal knowledge on this topic. Findings from this project's innovation will be presented to peers and faculty to bring awareness of this social behavior in the obstetric community.

Project Aims

The primary aim of this scholarly project was to assess maternal knowledge on gestational cannabis use and its effects on childhood development in parturient participants

attending an in-person educational class at the Osceola Pregnancy Center (OPC) in Kissimmee, FL. This project's objectives included:

1. Create evidence-based educational material approved by the Scientific Review Committee (SRC) on the effects of cannabis use tailored to the parturient population at the OPC by spring 2023.

2. Identify participants' baseline knowledge of gestational cannabis use by summer 2023.

3. Interpret participants' pretest and posttest scores to determine a difference in maternal baseline knowledge on gestational cannabis use following a 20-minute educational session at the OPC by summer 2023.

4. Provide evidence-based recommendations for perinatal education on the adverse effects of cannabis use during pregnancy to OPC stakeholders by fall 2023.

Methods

Design

This scholarly project utilized a quantitative quasi-experimental design. A pretest and posttest format supported the objective of assessing an improvement in baseline knowledge amongst pregnant women attending in-person classes at the OPC. This approach allowed for the immediate evaluation of knowledge differences and determined the effectiveness of the educational material. The participants were tested before and after the completion of the educational session on the adverse effects of gestational cannabis use.

Setting

The OPC is a non-profit organization in Kissimmee, Osceola County, located in the Central Florida region. According to the U.S. Census Bureau (2021), the total population in Kissimmee, FL, is approximately 79,436, with most of the residents being Latino, 69.6%, White,

59.6%, and Black, 10.6%. The OPC Director, Margaret Hennen, facilitates in providing monthly assistance to over 100 pregnant women and offering a variety of complementary health services.

Sample Methodology

A convenience sampling methodology was used to identify parturient women receiving assistance from the OPC as our target population. Clients attending OPC were primarily identified as Latino descent, ranging from 20-30 years of age and primarily speak English or Spanish. According to the GPower 3.1 software tool, an A priori power analysis was conducted to identify a sample size range of 35-50 participants to achieve statistical significance. The parameters included a medium effect size of 0.5, power of 0.8, and alpha error probability of 0.05, resulting in a minimum sample size of 35 participants. Inclusion criteria for recruitment consisted of parturient women, women of childbearing age, and comprehension of English and Spanish literacy. Exclusion criteria included other primary languages and OPC clients not receiving prenatal care.

Access and Recruitment Methods

A convenience sampling strategy was applied to recruit a target audience of women of childbearing age. The OPC has an incentive program, which offers courses to parturient women for the opportunity to gain reward points to procure items from the baby boutique. The Director of OPC assisted with distributing a letter of invitation during a single encounter to eligible clients for the opportunity to participate in these educational sessions. Advertisement material to aid as a reminder of scheduled educational sessions was available to potential participants in the form of flyers displayed on the bulletin boards located in the waiting area (see Appendix B).

Potential Risks, Discomforts, and Benefits for Participants

There were no potential risks associated with participating in the educational session. Potential discomforts included misunderstanding of the proposed innovation and educational material. Each participant received a hard copy of the educational information in the form of a brochure in their primary language as a reference for future encounters.

Ethical Considerations

The parturient population is a vulnerable population, and additional online safeguards, such as non-identifying usernames and Microsoft Forms, were employed to protect the participants. A participation agreement composed to an eighth-grade reading level, was provided for prospective participants in English and Spanish due to the known OPC population. ClariVita, a trustworthy platform partnered with AdventHealth's healthcare system, was utilized for the accurate translation of the participation agreement. The participation agreement outlined project details as well as confidentiality measures (see Appendix C). The agreements were collected prior to the delivery of educational material and were able to be redacted at any time. The participants were not coerced to participate, however, they did receive points to utilize in the baby boutique from the OPC as a part of their incentive program.

While monetary incentivizing can be deemed an ethical concern, extrinsic motivators such as non-monetary incentives, non-financial donations, and gift vouchers may be utilized to facilitate compensation for participants' time and inconvenience of participating (Hokke et al., 2018; Human Research Protection Program, 2021; Parkinson et al., 2019; University of California, Berkley, 2017). The use of extrinsic motivators helps facilitate enhanced participation while upholding ethical standards and legal requirements (Hokke et al., 2018). Compensation should always be given without coercion and should not compromise the participant's judgment

in assessing overall risks. For this scholarly project, participants were provided detailed information on the goals of the project along with clear communication on voluntary participation in the project. The participants of this scholarly project received a non-monetary incentive in the form of incentive points from the OPC as this was the current practice of the site facility to encourage participation in educational classes already available. These incentive points can be redeemed for baby supplies that were acquired from charitable donations made to the OPC by community members. No additional compensation was provided from the co-investigators. The participants were not coerced to participate and could withdraw from the project at any time without losing incentive points provided by the OPC.

Data Collection

Data was collected solely by the investigators utilizing Microsoft Forms, which included a face validated 10-question test composed of multiple-choice questions (see Appendix D). To ensure anonymity, each participant was instructed to create an unidentifiable username using their first and last name initial and their mother's birth year (example: RW1956) for data collection and analysis in Microsoft Forms. All data was collected within one face-to-face interaction to identify a difference in knowledge. The deployment of an identical test was utilized for the pretest and posttest in either English or Spanish.

Instruments

The educational material was formulated with evidence-based information found throughout the literature and was available in English and Spanish. Spanish educational material was translated with the assistance of a professional translator. The translated educational material included a 20-minute PowerPoint presentation, supplemental handout, and a 10-question test. To provide education to a larger target audience, all material adhered to an eighth-grade Flesch-

Kincaid readability score. Four live sessions were held, two in English and two in Spanish, with the assistance of a qualified interpreter provided from the ClariVita services. To maintain cohesion between live sessions, the co-investigators followed an outline to ensure all participants received the same information. All instrumentation underwent face validation review by one end-user and six qualified individuals with relevant expertise. The qualified individuals included three nurse anesthesia doctoral students and three faculty members from the doctor of nurse anesthesia practice (DNAP) department.

Data Analysis and Management

Microsoft software platforms such as Teams, Outlook, Lens, Excel spreadsheets and Forms meet compliance under the Health Insurance Portability and Accountability Act and the Family Educational Rights and Privacy Act guidelines were utilized for data management (Mazzoli & Vukos-Walker, 2022; Mazzoli et al., 2022). Project voluntary participation agreements were scanned via the Microsoft Lens application into digital copies and uploaded into a password-protected Microsoft Teams folder and hard copies were immediately shredded. This password-protected folder will only be accessible by the principal investigator, Dr. Jill Mason, and the co-investigators Danielle Smith, Harlie Visser and Taylor Crum. After 7 years, the password-protected folder will be automatically deleted by the information technology department at AdventHealth University.

The anonymous pretest and posttest results from Microsoft Forms were exported as a Microsoft Excel spreadsheet and submitted via Microsoft Outlook email to AdventHealth University's statistician, Tho Nguyen, for data analysis. Statistical data analysis was conducted via the R Foundation for Statistical Computing (R), version 4.2.0. The Wilcoxon signed-rank test was selected to investigate changes in pretest and posttest scores from one-time point to another

(Laerd Statistics, 2018). The Wilcoxon signed rank test was chosen as there is a predicted small sample size and data obtained is unlikely to be normally distributed. All pretest and posttest data were analyzed using descriptive statistics. The Wilcoxon signed-rank test assessed innovation significance among the test scores utilizing a predetermined p-value of <0.05.

Framework

The PDSA cycle begins with the Plan phase, which involves identifying a purpose, formulating objectives, and setting the plan into action (The W. Edwards Deming Institute, 2022). During the Plan phase, a literature review and a synthesis of evidence was conducted and determined a gap in maternal baseline knowledge on cannabis use and its effects on the fetus. The Do phase involves implementation, which included the administration of an evidence-based PowerPoint presentation to participants attending the OPC. Next, the Study phase measured outcomes to determine the level of innovation success as well as potential areas for improvement (The W. Edwards Deming Institute, 2022). In this phase, results of pretest and posttest scores were measured to determine the difference in baseline knowledge among participants at the OPC. The last phase is where integrated learning is assessed, adjusted, and utilized to span for larger-scale implementation (The W. Edwards Deming Institute, 2022). The Act Phase involved assessing areas for improvement, making evidence-based recommendations to the OPC for future sustainability, as well as leaving the facility with educational materials such as brochures to utilize for future education.

Planning and Procedures

Planning

Multiple key stakeholders were identified based on their expertise in perinatal education and relevance to the intended target audience. The key stakeholders identified are the OPC Director, Margaret Hennen, Medical Director, Dr. Paul Thorne, and a client attending the OPC.

The non-profit organization received complimentary bilingual educational resources to be utilized in subsequently held classes held by the OPC Director to keep the members informed, resulting in buy-in of stakeholders. The stakeholders provided a location to conduct the innovation and the co-investigators provided the computers to obtain pretest and posttest data. Other resources acquired for this scholarly project included a translation service, paper, and printer ink (see Appendix E).

Implementation

The implementation of this project consisted of providing participants with a pretest to determine the baseline knowledge on the effects of gestational cannabis use on childhood development. The pretest was followed by a 20-minute in-person educational PowerPoint presentation. Afterwards, the participants were provided an identical posttest to assess a difference in knowledge.

Barriers and Facilitators

Potential barriers included: refusal to participate, lack of technology, scheduling and language barrier, and lack of engagement from participants. Solutions included: a screen projector provided by OPC, laptops provided by co-investigators, multiple scheduled sessions, and offering translated educational material. Facilitating factors for this project included key player expertise, administrative support, and technological assistance.

Procedures to Sustain

Sustainability was addressed by collaborating this education innovation with the OPC incentive program and maintained sustainability with periodic re-evaluation of the proposed project.

Anticipated Limitations

Foreseeable limitations included the effectiveness of cannabis-related perinatal education secondary to language barriers, literacy comprehension, anticipated small sample size, a single site, and utilization of a face-validated instrument. The translated material enhanced engagement and accommodated participant satisfaction. The controversial connotation related to this topic may have skewed the perception of participants and created a sentiment of hesitancy to participate in the innovation. An analysis of knowledge comprehension amongst a singular group eliminated the need for a comparison group and is, therefore, not applicable.

Timeline

In summer of 2022, the project was initiated, and documents were submitted to the DNAP scholarly project chair for review. In November 2022, a proposal plan was submitted to the Institutional Review Board and SRC to receive a non-research designation for an evidence-based project initiative. During spring of 2023, the proposed methodology was presented and reviewed by the Board of Directors at the OPC. After approval was granted from the Board of Directors for project implementation, the educational sessions were scheduled monthly from April to July, on weekday afternoons, in collaboration with the OPC and did not interfere with students prescheduled courses. After completion of the data collection, data analysis was completed in fall 2023 with the assistance of AdventHealth University's statistician. In fall 2023 to spring 2024, the project poster board will be completed and evidence-based recommendations will be provided to the OPC. Lastly, in the spring of 2024, dissemination will ensue at AdventHealth University (AHU) in Orlando, FL, to faculty and peers (see Appendix F).

Results and Findings

There were four sessions that were offered through the OPC, which included two Spanish and two English sessions. There were a total of 16 participants, and each participant partook in one of the four educational sessions offered (refer to Figure 1). There was a 100% response rate from participants for both pretest and posttest data collection. No participants were excluded from the data collection.

Figure 1

Monthly Participants Attendance
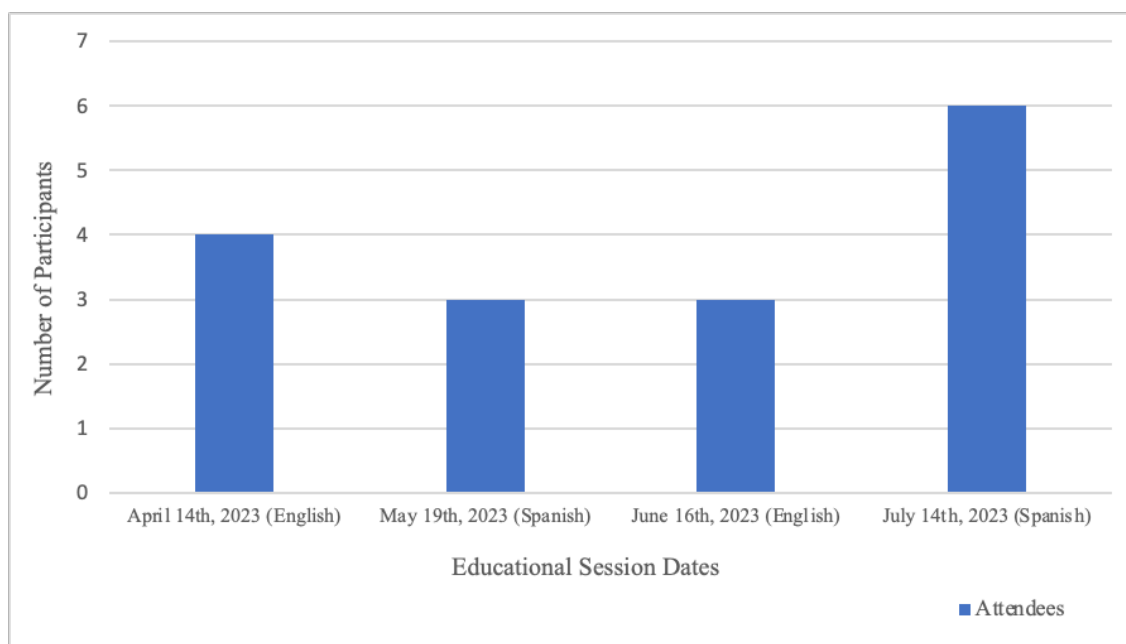
There were a total of nine individuals that attended a Spanish session and seven individuals that attended an English session. All participants were given the option of English or Spanish written materials at these scheduled sessions. Three participants decided to utilize the English testing format despite attending the Spanish educational session (refer to Figure 2). All participants were clients of the OPC due to recruitment methods. No additional demographic

information was taken from individuals due to the vulnerability of the intended target

population.

Figure 2

Participant Class Attendance v. Written Format Utilized
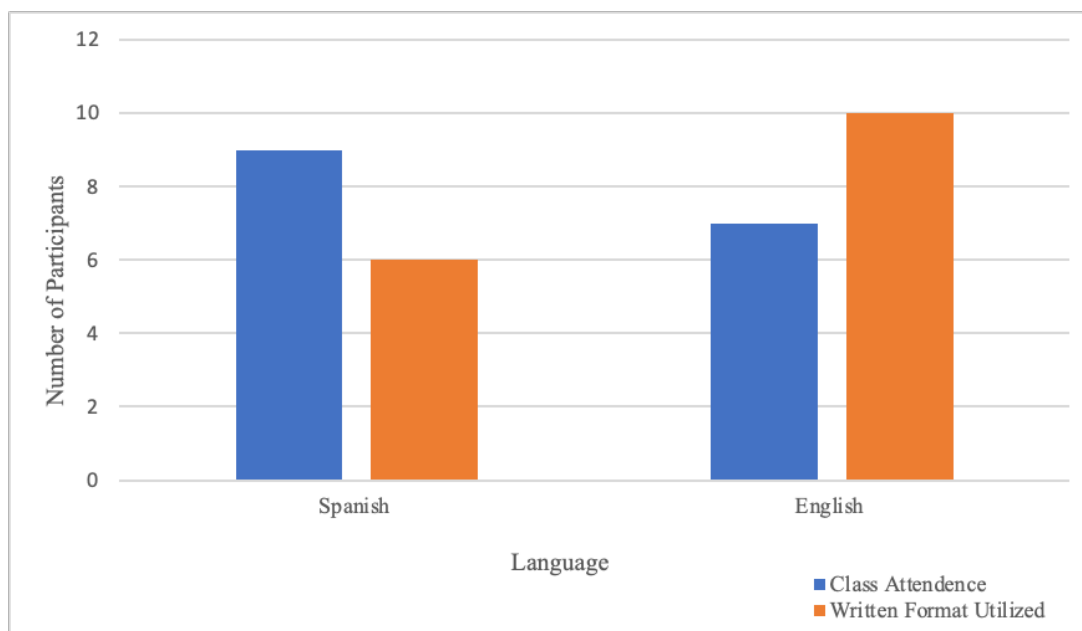
Quantitative

A one-sided level of significance alpha value ($\alpha = 0.05$) was utilized to assess innovation

significance among each test score. The Wilcoxon signed rank test was utilized to provide

descriptive and statistical analysis, which showed that the intervention elicited a statistically

significant change in participant's knowledge ($Z = -3.53$, $p < 0.001$) (refer to Table 1 and 2). The

total participants (n=16) mean value for the pretest was 4.63 and the posttest 8.87, and the

median test score was 4.50 for pre- and 9.0 post-intervention (refer to Table 3). The results from

the Wilcoxon signed rank test analyzed the difference in correct answers from the pretest and

posttest results of each participant (n=16) (refer to Figure 3), which showed the rejection of the

null hypothesis (p-value 0.0002079; $\alpha = 0.05$). Statistical significance has been proven that after

the completion of a 20-minute educational session, there is knowledge improvement among

mothers regarding the negative effects of cannabis use during pregnancy as compared to before.

Table 1

Test Statistics[a]

	PostScore - PreScore
Z	-3.530[b]
Asymp. Sig. (2-tailed)	<.001

a. Wilcoxon signed rank test, b. Based on negative ranks

Table 2

Ranks

		n	Mean Rank	Sum of Ranks
PostScore - PreScore	Negative Ranks	0[a]	.00	.00
	Positive Ranks	16[b]	8.50	136.00
	Ties	0[c]		
	Total	16		

a. PostScore < PreScore, b. PostScore > PreScore, c. PostScore = PreScore

Table 3

Descriptive Statistics

							Percentile	
	n	Mean	Std. Deviation	Minimum	Maximum	25th	50th (Median)	75th
PreScore	16	4.63	1.668	1	8	4.00	4.50	5.75
PostScore	16	8.87	1.628	4	10	9.00	9.00	10.00

Figure 3

Number of Participants Who Had Correct Answers
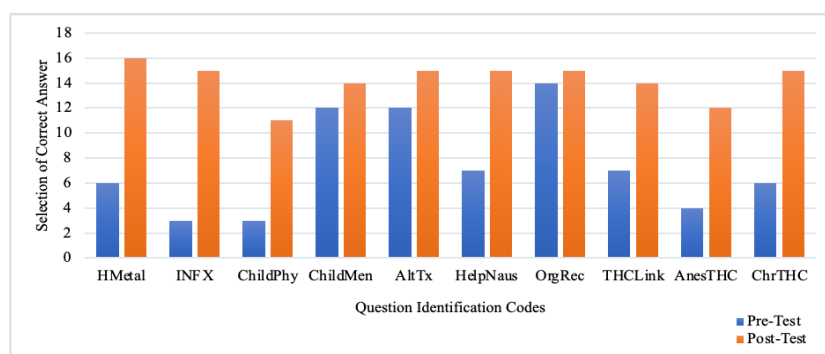
Note. Figure 3 depicts the identification code of the 10 multiple choice questions and the amount of correct answers for each question for the pretest and posttest.

Discussion, Applicability to Practice, and Contribution to Professional Growth

The utilization of cannabis throughout pregnancy can cause both physical and psychological effects on the child throughout the lifespan. Parturients lack factual knowledge of the deleterious effects associated with this behavior. Despite the recognized adverse effects associated with gestational cannabis use, there continues to be a lack of community outreach focused on education around this growing topic. The purpose of this scholarly project was to provide education to parturient participants on the risks associated with gestational cannabis use in an effort to tackle the evident perinatal education deficit.

The findings obtained from this educational innovation contributed to the body of knowledge within the literature surrounding a deficit in maternal baseline knowledge on the consequential effects of gestational cannabis use. The results highlighted the positive influence healthcare-driven education has on parturient awareness surrounding gestational cannabis use. This scholarly project revealed a need for continued perinatal education within the community to

provide mothers with factual information to make informed decisions while providing healthy lifestyle alternatives.

The innovation PICOT aimed to determine if there was a difference in maternal baseline knowledge following a 20-minute educational session on gestational cannabis use and childhood development among parturient clients at the OPC. Based on the statistical significance of the data, the co-investigators were able to accomplish the intended project aims and objectives, allowing for the development of evidence-based recommendations for perinatal education to the OPC on the adverse effects of gestational cannabis use. The co-investigators utilized the PDSA cycle to develop the methodology of the innovation and the course of action for data collection and analysis. The four phases of the PDSA framework support the validity of community-based education and its impact on knowledge improvement.

The lack of perinatal education on this matter is evident in the poor pretest results from the sample population, which correlates with the problem identified in the literature. Data results from the posttest ($Z = -3.53$, $p < 0.001$) revealed an increase in maternal baseline knowledge compared to the pretest results. It is conclusive that raising maternal awareness on this topic for the clients at the OPC was impactful and enhanced maternal knowledge on childhood and anesthetic adverse effects. This scholarly project stated a positive correlation between the implementation of a 20-minute educational session and the improvement of maternal baseline knowledge on gestational cannabis use, which will promote informed decision-making on the utilization during and after pregnancy.

While this project did not achieve the original predicted sample size, the results remained statistically significant. During the implementation phase, the co-investigators discovered the impact felt within the community on the recent Senate Bill (SB) passed in the state of Florida

regarding immigration, SB 1718 (2023). These new immigration policies provoked fear among the OPC clients, resulting in less participation than previously anticipated. This unanticipated challenge was addressed by ensuring to all participants that their participation was entirely voluntary and that educational sessions were kept confidential.

Community outreach perinatal educational sessions, as implemented in this scholarly project, can be utilized by future pregnancy organizations. Future recommendations could include providing parental education on this topic to allow both partners to be fully informed on the potential physical and psychological adverse effects on the child. In order to sustain educational efforts, the OPC faculty were educated on this topic and received educational materials such as pamphlets to continue to spread awareness on cannabis use effects.

This scholarly project contributed to improved awareness of the identified problem by utilizing a community-based setting to inform women of childbearing age on the adverse effects of gestational cannabis use on the child and its subsequent impact on anesthetic management. In addition, this scholarly project directly impacts the anesthesia community by bringing awareness to anesthesia providers on this topic, to improve the optimization of parturients presenting for labor analgesia or surgical procedures. This scholarly project can contribute to strengthening patient-provider relationships to openly discuss this matter, which can help with disclosure during preoperative anesthesia encounters.

Limitations

This scholarly project faced multiple limitations. The project was limited to a small convenience sample due to the utilization of a single perinatal care facility. The specificity of inclusion and exclusion criteria for participation in this education innovation yielded a small sample size. Participation recruitment was hindered due to the social nature of the OPC clientele,

which often lacked reliability in future appointment returns. Due to the utilization of face-validated instrumentation and a single site, the replicability and reliability of future studies may possess varying results. While generalizations can be extrapolated from the significant findings of this scholarly project, further investigation utilizing multiple sites should be conducted to confirm this.

Conclusion

Societal misconceptions regarding gestational cannabis use and its effects on childhood development are a growing concern within the pregnant population. Throughout the literature, community influence and lack of perinatal education were identified as contributing factors to the skewed perceptions of cannabis use for pregnancy-related symptoms. This scholarly project achieved the primary intended purpose of educating parturients on the risks associated with gestational cannabis use and achieved statistical significance from the data collected. The findings obtained from the innovation demonstrated the effectiveness of community-based education on improved maternal baseline knowledge on gestational cannabis use. Evidence-based recommendations can be made to key stakeholders on the positive impact continued perinatal education on gestational cannabis use can have on the perinatal community.

Dissemination Plan

In spring 2024, at AHU in Orlando, FL, dissemination of our findings will be publicly presented to AHU faculty, students, and key stakeholders. A poster and PowerPoint presentation will be utilized to address evidence-based recommendations formulated from data analysis and may be presented at a conference for the AANA or Florida Association of Nurse Anesthesiology. Co-investigators may seek publication in a peer-reviewed journal. An executive summary of the scholarly project findings will be formulated and sent via email to the OPC leadership for future

perinatal education utilization. The scholarly project will then be accessible in the AHU library archives.

Budget

The co-investigators personally funded the services needed for this scholarly project (see Appendix E).

References

Alexander, J., & Joshi, G. (2019). A review of the anesthetic implications of marijuana use. *Baylor University Medical Center, 32*(3), 364-371. https://doi.org/10.1080/08998280.2019.1603034

American Association of Nurse Anesthesiology. (2020). *Scope of nurse anesthesia practice.* https://www.aana.com/docs/default-source/practice-aana-com-web-documents-(all)/professional-practice-manual/scope-of-nurse-anesthesia-practice.pdf?sfvrsn=250049b1_10

American College of Obstetricians and Gynecologists. (2017). *Committee opinion 722: Marijuana use during pregnancy and lactation.* https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2017/10/marijuana-use-during-pregnancy-and-lactation

American College of Obstetricians and Gynecologists. (2018). *Marijuana and pregnancy.* https://www.acog.org/womens-health/infographics/marijuana-and-pregnancy

American Society of Anesthesiologists. (2020). *Cannabis use prompts need for more anesthesia during surgery, increases pain and postoperative opioid use.* https://www.asahq.org/about-asa/newsroom/news-releases/2020/10/cannabis-and-postoperative-pain

Barbosa-Leiker, C., Burduli, E., Smith, C. L., Brooks, O., Orr, M., & Gartstein, M. (2020). Daily cannabis use during pregnancy and postpartum in a state with legalized recreational cannabis. *Journal of Addiction Medicine*, *14*(6), 467–474. https://doi.org/10.1097/ADM.0000000000000625

Bayrampour, H., Zahradnik, M., Lisonkova, S., & Janssen, P. (2019). Women's perspectives about cannabis use during pregnancy and the postpartum period: An integrative review. *Preventive Medicine, 119*, 17-23. https://doi.org/10.1016/j.ypmed.2018.12.002

Brown, Q., Sarvet, A., Shmulewitz, D., Martins, S., Wall, M., & Hasin, D. (2017). Trends in marijuana use among pregnant and nonpregnant reproductive-aged women, 2002-2014. *The Journal of the American Medical Association, 317*(2), 207-209. https://doi.org/10.1001/jama.2016.17383

Chang, J., Tarr, J., Holland, C., De Genna, N., Richardson, G., Rodriguez, K., Sheeder, J., Kraemer, K., Day, N., Rubio, D., Jarlenski, M., & Arnold, R. (2019). Beliefs and attitudes regarding prenatal marijuana use: Perspectives of pregnant women who report use. *Drug and Alcohol Dependence, 196*, 14-20. https://doi.org/10.1016/j.drugalcdep.2018.11.028

Cheah, I. (2019). Economic assessment of neonatal intensive care. *Translational Pediatrics, 8*(3), 246-256. https://doi.org/10.21037/tp.2019.07.03

Cohen, C., Baird, M., Koirola, N., Kandrack, R., & Martsolf, G. (2021). The surgical and anesthesia workforce and provision of surgical services in rural communities: A mixed-methods examination. *The Journal of Rural Health, 37*(1), 45-54. https://doi.org/10.1111/jrh.12417

Daha, S., Sharma, P., Sah, P., Karn, A., Poudel, A., & Pokhrel, B. (2020). Effects of prenatal cannabis use on fetal and neonatal development and its association with neuropsychiatric disorders: A systematic review. *Neurology, Psychiatry, and Brain Research, 38*, 20-26. https://doi.org/10.1016/j.npbr.2020.08.008

Davidson, E., Raz, N. & Eyal, A. (2020). Anesthetic considerations in medical cannabis patients. *Current Opinion in Anaesthesiology, 33*(6), 832-840. https://doi.org/10.1097/ACO.0000000000000932

Day, N., Leech, S., & Goldschmidt, L. (2011). The effects of prenatal marijuana exposure on delinquent behaviors are mediated by measures of neurocognitive functioning. *Neurotoxicology and Teratology, 33*(1), 129-136. https://doi.org/10.1016/j.ntt.2010.07.006

Fergusson, D., Horwood, L., & Northstone, K. (2002). Maternal use of cannabis and pregnancy outcome. *An International Journal of Obstetrics and Gynaecology, 109*(1), 21-27. https://doi.org/10.1111/j.1471-0528.2002.01020.x

Fla. SB 1718 (2023). https://www.flsenate.gov/Session/Bill/2023/1718

Gunn, J., Rosales, C., Center, K., Nuñez, A., Gibson, S., Christ, C., & Ehiri, J. (2016). Prenatal exposure to cannabis and maternal and child health outcomes: A systematic review and meta-analysis. *BMJ Open, 6*(4), 1-8. https://doi.org/10.1136/bmjopen-2015-009986

Hokke, S., Hackworth, N. J., Quin, N., Bennetts, S. K., Win, H. Y., Nicholson, J. M., Zion, L., Lucke, J., Keyzer, P. & Crawford, S. B. (2018). Ethical issues in using the internet to engage participants in family and child research: A scoping review. *PLOS ONE, 13*(9), e0204572. https://doi.org/10.1371/journal.pone.0204572

Horvath, C., Dalley, C., Grass, N., & Tola, D. (2019). Marijuana use in the anesthetized patient: History, pharmacology, and anesthetic considerations. *AANA Journal, 87*(6), 451-458. https://www.aana.com/docs/default-source/aana-journal-web-documents-1/marijuana-use-in-the-anesthetized-patient-history-pharmacology-and-anesthetic-considerations-december-2019.pdf?sfvrsn=ce829198_4

Human Research Protection Program. (2021). *Compensation and payments to research participants and research personnel.* Duke University Health System https://irb.duhs.duke.edu/sites/default/files/2022-04/compensation_payments_to_research_participants_3-18-2021.pdf

Laerd Statistics. (2018). *Wilcoxon signed-rank test using SPSS statistics.* https://statistics.laerd.com/spss-tutorials/wilcoxon-signed-rank-test-using-spss-statistics.php

Mark, K., Gryczynski, J., Axenfeld, E., Schwartz, R., & Terplan, M. (2017). Pregnant women's current and intended cannabis use in relation to their views toward legalization and knowledge of potential harm. *Journal of Addiction Medicine, 11*(3), 211-216. https://doi.org/10.1097/ADM.0000000000000299

Marroun, H., Hudziak, J., Tiemeier, H., Creemers, H., Steegers, E., Jaddoe, V., Hofman, A., Verhulst, F., Van den Brink, W., & Huizink, A. (2011). Intrauterine cannabis exposure leads to more aggressive behavior and attention problems in 18-month-old girls. *Drug and Alcohol Dependence, 118*(2-3), 470-474. https://doi.org/10.1016/j.drugalcdep.2011.03.004

Mazzoli, R. & Vukos-Walker, C. (2022). *Family educational rights and privacy act (FERPA).* https://learn.microsoft.com/en-us/compliance/regulatory/offering-ferpa

Mazzoli, R., Cross, K., Vukos-Walker, C., Buck, A., & Woitasen, D. (2022). *Health insurance portability and accountability act (HIPAA) & health information technology for economic and clinical health (HITECH) act.* https://learn.microsoft.com/en-us/compliance/regulatory/offering-hipaa-hitech

Nguyen, V., & Harley, K. (2021). Prenatal cannabis use and infant birth outcomes in the

    pregnancy risk assessment monitoring system. *The Journal of Pediatrics*, *236,* 1-7.

    https://doi.org/10.1016/j.jpeds.2021.08.088

Parkinson, B., Meacock, R., Sutton, M., Fichera, E., Mills, N., Shorter, G. W., Treweek, S.,

    Harman, N., Brown, R., Gillies, K. & Bower, P. (2019). Designing and using incentives

    to support recruitment and retention in clinical trials: A scoping review and a checklist

    for design. *Trials, 20*(1), 624-624. https://doi.org/10.1186/s13063-019-3710-z

Paul, S., Hatoum, A., Fine, J., Johnson, E., Hansen, I., Karcher, N., Moreau, A., Bondy, E., Qu,

    Y., Carter, E., Rogers, C., Agrawal, A., Barch, D., & Bogdan, R. (2021). Associations

    between prenatal cannabis exposure and childhood outcomes: Results from the ABCD

    study. *JAMA Psychiatry, 78*(1), 64-76. https://doi.org/10.1001/jamapsychiatry.2020.2902

Pike, C., Sofis, M., & Budney, A. (2021). Correlates of continued cannabis use during

    pregnancy. *Drug and Alcohol Dependence, 227*, Article 108939.

    https://doi.org/10.1016/j.drugalcdep.2021.108939

Reed, J., Davey, N., & Woodcock, T. (2016). The foundations of quality improvement science.

    Future Hospital Journal, 3(3), 199–202. https://doi.org/10.7861/futurehosp.3-3-199

Rodriguez, C., Sheeder, J., Allshouse, A., Scott, S., Wymore, E., Hopfer, C., Hermesch, A., &

    Metz, T. (2019). Marijuana use in young mothers and adverse pregnancy outcomes: A

    retrospective cohort study. *An International Journal of Obstetrics and Gynaecology,*

    126(12), 1491-1497. https://doi.org/10.1111/1471-0528.15885

Roush, K. (2019). *A nurse's step by step guide to writing a dissertation or scholarly project.* (2nd

    ed.). Sigma Theta Tau International Honor Society of Nurse.

Sasso, E., Bolshakova, M., Bogumil, D., Johnson, B., Komatsu, E., Sternberg, J., Cortessis, V., & Mullin, P. (2021). Marijuana use and perinatal outcomes in obstetric patients at a safety net hospital. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 266*, 36-41. https://doi.org/10.1016/j.ejogrb.2021.09.015

Suhre, W., O'Reilly-Shah, V., & Van Cleve, W. (2020). Cannabis use is associated with a small increase in the risk of postoperative nausea and vomiting: A retrospective machine-learning causal analysis. *BMC Anesthesiology, 20*(115), 1-8. https://doi.org/10.1186/s12871-020-01036-4

The W. Edwards Deming Institute. (2022). *PDSA Cycle*. https://deming.org/explore/pdsa/

United States Census Bureau. (2021, July). *QuickFacts* [Infographic]. US Department of Commerce. https://www.census.gov/quickfacts/fact/table/kissimmeecityflorida/PST045221

University of California, Berkeley. (2017). *Compensation of research subjects*. https://cphs.berkeley.edu/compensation.pdf

U.S. Department of Health & Human Services. (2019). *U.S. surgeon general's advisory: Marijuana use and the developing brain*. https://www.hhs.gov/surgeongeneral/reports-and-publications/addiction-and-substance-misuse/advisory-on-marijuana-use-and-developing-brain/index.html

Warshak, C., Regan, J., Moore, B., Magner, K., Kritzer, S., & Van Hook, J. (2015). Association between marijuana use and adverse obstetrical and neonatal outcomes. *Journal of Perinatology, 35*(12), 991-995. https://doi.org/10.1038/jp.2015.120

Weisbeck, S., Bright, K., Ginn, C., Smith, J., Hayden, K., & Ringham, C. (2020). Perceptions about cannabis use during pregnancy: A rapid best-framework qualitative synthesis. *Canadian Journal of Public Health, 112*(1), 49-59. https://doi.org/10.17269/s41997-020-00346-x

Wiseman, L., Mahu, I., & Mukhida, K. (2022). The effect of preoperative cannabis use on postoperative pain following gynaecologic oncology surgery. *Journal of Obstetrics and Gynaecology Canada, 44*(7), 750–756. https://doi.org/10.1016/j.jogc.2022.01.018

Woodruff, K., Scott, K., & Roberts, S. (2021). Pregnant people's experiences discussing their cannabis use with prenatal care providers in a state with legalized cannabis. *Drug and Alcohol Dependence, 227*, Article 108998. https://doi.org/10.1016/j.drugalcdep.2021.108998

Young-Wolff, K., Ray, G., Alexeeff, S., Adams, S., Does, M., Ansley, D., & Avalos, L. (2021). Rates of prenatal cannabis use among pregnant women before and during the COVID-19 pandemic. *The Journal of the American Medical Association, 326*(17), 1745-1747. https://doi.org/10.1001/jama.2021.16328

Zammit, S., Thomas, K., Thompson, A., Horwood, J., Menezes, P., Gunnell, D., Hollis, C., Wolke, D., Lewis, G., & Harrison, G. (2009). Maternal tobacco, cannabis and alcohol use during pregnancy and risk of adolescent psychotic symptoms in offspring. *British Journal of Psychiatry, 195*(4), 294-300. https://doi.org/10.1192/bjp.bp.108.

Appendix A

References

Paul, S., Hatoum, A., Fine, J., Johnson, E., Hansen, I., Karcher, N., Moreau, A., Bondy, E., Qu, Y., Carter, E., Rogers, C., Agrawal, A., Barch, D., & Bogdan, R. (2021). Associations between prenatal cannabis exposure and childhood outcomes: Results from the ABCD study. *JAMA Psychiatry, 78*(1), 64-76. https://doi.org/10.1001/jamapsychiatry.2020.2902

Marroun, H., Hudziak, J., Tiemeier, H., Creemers, H., Steegers, E., Jaddoe, V., Hofman, A., Verhulst, F., Van den Brink, W., & Huizink, A. (2011). Intrauterine cannabis exposure leads to more aggressive behavior and attention problems in 18-month-old girls. *Drug and Alcohol Dependence, 118*(2-3), 470-474. https://doi.org/10.1016/j.drugalcdep.2011.03.004

Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
Study One To determine if cannabis exposure during pregnancy is associated with adverse child outcomes. **Study Two** To investigate the relationship of gestational cannabis usage and its impact on childhood attention problems and aggressive behavior. **Design** **Study One** Cross-sectional study **Study Two** Design not stated, but appeared to be a cross-sectional study	**Study One** Primary outcome: Symptoms of psychopathology, cognition, and sleep Secondary outcomes: Social context and length of maternal cannabis exposure **Study Two** Primary outcome: Childhood behavior and emotional problems Secondary outcomes: Social context and paternal cannabis use	**Study One** Setting: Not stated Subjects: 11,785 children born between 2005-2009 whose parents completed the baseline session of the ongoing longitudinal ABCD Study **Study Two** Setting: Rotterdam, Netherlands Subjects: 4,077 children at 18 months old that were subsequently enrolled in the Generation R study	**Study One** Prodromal Questionnaire-Brief Child version, Child Behavior Checklist, National Institutes of Health Toolbox Cognition Battery-Total Cognition Composite, Sleep Disturbance Scale for Children, and caregivers' retrospective reports **Study Two** The Child Behavior Checklist for toddlers (CBCL 1 ½ - 5 years) and a parental self-report questionnaire	**Study One** Exposure was associated with higher incidences of psychotic-like experiences, lower cognition as well as social and sleep problems (all $|\beta| > 0.02$; all FDR-corrected $P < .03$). **Study Two** Exposure was associated with behavioral problems in early childhood but only in girls and only in increased aggressive behavior (B = 2.02; 95% CI: 0.30–3.73; p = 0.02) and attention problems (B = 1.04; 95% CI: 0.46–1.62; p < 0.001). **Implications** **Study One** Cannabis use during pregnancy was associated with greater risks of psychopathology during middle childhood. **Study Two** Intrauterine cannabis exposure may increase the risk for aggression and attention problems in young girls.	**Study One** **Methodological flaws:** Convenience sampling, use of unvalidated outcome measures and recruitment bias **Inconsistency:** None **Indirectness:** None **Imprecision**: Small number of participants (655) in the sample were exposed to cannabis during pregnancy. **Publication bias:** None **Study Two** **Methodological flaws:** Use of unvalidated outcome measures and recruitment bias **Inconsistency:** None **Indirectness:** None **Imprecision:** Wide confidence intervals **Publication bias:** None

References

Day, N., Leech, S., & Goldschmidt, L. (2011). The effects of prenatal marijuana exposure on delinquent behaviors are mediated by measures of neurocognitive functioning. *Neurotoxicology and Teratology, 33*(1), 129-136. https://doi.org/10.1016/j.ntt.2010.07.006

Zammit, S., Thomas, K., Thompson, A., Horwood, J., Menezes, P., Gunnell, D., Hollis, C., Wolke, D., Lewis, G., & Harrison, G. (2009). Maternal tobacco, cannabis and alcohol use during pregnancy and risk of adolescent psychotic symptoms in offspring. *British Journal of Psychiatry, 195*(4), 294-300. https://doi.org/10.1192/bjp.bp.108.062471

Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
Study One To assess the correlation between prenatal cannabis use on delinquent behaviors in the offspring. **Study Two** To examine the effects of maternal cannabis use on offspring psychotic symptoms.	**Study One** Primary outcome: Delinquent behaviors from prenatal cannabis exposure Secondary outcome: Maternal education, frequency of exposure, and polysubstance use **Study Two** Primary outcome: Maternal substance use correlation with risk for adolescent adverse psychological symptoms	**Study One** Setting: Prenatal clinic in Pittsburgh, Pennsylvania Subjects: 525 mothers within their fourth gestational month and the offspring of those mothers that were between 10-14 years old **Study Two** Setting: Avon Health Authority Area in the United Kingdom	**Study One** Self-report delinquency scale (SRD), Child Behavior Checklist (CBCL), Children Depression Inventory (CDI), Wide Range assessment of memory and learning (WRAML), Stanford-Binet Intelligence Scale (4th ed.), and maternal self-reports **Study Two** Psychosis-like symptoms semi-structured interview (PLIKSi), face-to-	**Study One** Heavy prenatal cannabis use was associated with delinquent behaviors at 14 years old (CI 1.05-2.96; p <0.03) and child depression at 10 years old (p <0.001). **Study Two** Maternal cannabis use was not a risk factor for suspected or definite PLIKS in offspring (aOR = 0.94; 95% CI: 0.62-1.41, *P* = 0.755).	**Study One** **Methodological flaws:** Unvalidated outcome measures and convenience sampling **Inconsistency:** None **Imprecision:** Wide confidence interval **Publication bias:** None **Study Two** **Methodological flaws:** Unvalidated outcomes measures and homogenous sample. **Inconsistency:** None **Indirectness:** None **Imprecision:** Small (1,326) number of
Design					participants admitted to maternal cannabis use. **Publication bias:** None
Study One Longitudinal study **Study Two** Longitudinal study	Secondary Outcome: Risk of psychopathology, perinatal outcomes, and cognitive ability during childhood	Subjects: 6,356 adolescents that were 12 years old	face interviews, and self-report postal questionnaires	**Implications** **Study One** Prenatal cannabis use has an increased risk of early childhood depression and delinquent behaviors, suggesting abstinence. **Study Two** There is no association between maternal cannabis use during pregnancy and risk of psychotic symptoms.	

References

Fergusson, D., Horwood, L., & Northstone, K. (2002). Maternal use of cannabis and pregnancy outcome. *BJOG: An International Journal of Obstetrics & Gynaecology, 109*(1), 21-27. https://doi.org/10.1111/j.1471-0528.2002.01020.x

Warshak, C., Regan, J., Moore, B., Magner, K., Kritzer, S., & Van Hook, J. (2015). Association between marijuana use and adverse obstetrical and neonatal outcomes. *Journal of Perinatology, 35*(12), 991-995. https://doi.org/10.1038/jp.2015.120

Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
Study One Assess the association between cannabis use and confounding independent effects on pregnancy outcome. **Study Two** To examine the associations between perinatal cannabis use and adverse obstetrical and neonatal effects. **Design** **Study One** Design not stated, but appeared to be a cross-sectional study **Study Two** Retrospective cohort study	**Study One** Primary outcome: Infant birthweight, length, and head circumference Secondary Outcome: Preterm delivery, stillbirth, perinatal mortality, and neonatal intensive care admission (NICU) **Study Two** Primary outcome: The frequency of cannabis use and adverse neonate outcomes Secondary outcome: Preterm delivery, fetal growth restrictions, stillbirths, NICU admissions, and perinatal mortality	**Study One** Setting: Avon, England Subjects: 12,129 women who are 18-20 weeks of gestation between the age of 20-35 years old **Study Two** Setting: University of Cincinnati Medical Center Subjects: 6,468 individuals that were first time mothers between the age of 24-25	**Study One** Avon Longitudinal Study of Pregnancy and Childhood (ALSPAC) self-report questionnaire as well as neonate and mother medical chart reviews. **Study Two** Universal toxicology screening, University of Cincinnati Redcap electronic data capture tool, self-report as well as maternal and neonatal chart reviews.	**Study One** Maternal cannabis was associated with a lower birthweight (P < 0.0001) and shorter birth length (P=0.009). **Study Two** Cannabis use during pregnancy was associated with small for gestation age (SGA) with a (P<0.001; aOR 1.30; 95% CI: 1.03-1.62) and NICU admission (P= 0.01, aOR 1.54; 95% CI: 1.14-2.07). **Implications** **Study One** Perinatal use of cannabis resulted in lower birth weights and shorter infant lengths compared to mothers without cannabis exposure. **Study Two** The use of cannabis during pregnancy has shown to result in SGA and NICU admissions after delivery.	**Study One** **Methodological flaws:** Unvalidated outcome measures and recruitment bias. **Inconsistency:** None **Indirectness:** None **Imprecision:** None **Publication Bias:** None **Study Two** **Methodological flaws:** Use of unvalidated outcome measures and ethnicity was not addressed. **Inconsistency:** None **Indirectness:** None **Imprecision:** Small (361) number of participants admitted to maternal cannabis use. **Publication bias:** None

References

Nguyen, V., & Harley, K. (2021). Prenatal cannabis use and infant birth outcomes in the pregnancy risk assessment monitoring system. *The Journal of Pediatrics*, *236,* 1-7. https://doi.org/10.1016/j.jpeds.2021.08.088

Rodriguez, C., Sheeder, J., Allshouse, A., Scott, S., Wymore, E., Hopfer, C., Hermesch, A., & Metz, T. (2019). Marijuana use in young mothers and adverse pregnancy outcomes: A retrospective cohort study. *BJOG: An International Journal of Obstetrics and Gynaecology, 126*(12), 1491-1497. https://doi.org/10.1111/1471-0528.15885

Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
Study One To examine the association of prenatal cannabis use and adverse infant outcomes. **Study Two** To evaluate maternal cannabis use and its adverse pregnancy outcomes using biological sampling.	**Study One** Primary outcome: Low birth weight (LBW), small for gestational age (SGA), and preterm births Secondary Outcomes: Frequency of cannabis exposure and social context **Study Two** Primary outcome: Spontaneous preterm birth, stillbirth, and SGA Secondary outcomes: Abruption, gestational age at delivery, infant birthweight, length, head circumference, neonatal intensive care (NICU) admissions, and Agar scores at 5 minutes	**Study One** Setting: 20 states and territories Subjects: 32,583 women who delivered singleton infants between 2017-2019 **Study Two** Setting: University of Colorado Hospital Subjects: 1,206 mothers in a maternity program for young women (13-22) who delivered between September 2011-May 2017	**Study One** Pregnancy Risk Assessment Monitoring System (PRAMS) questionnaire. **Study Two** Urine toxicology testing, self-report questionnaire as well as maternal and neonate chart reviews.	**Study One** Exposure was associated with increased risk of LBW (OR, 1.89; 95% CI, 1.59-2.24), preterm birth (OR, 1.40; 95% CI, 1.14-1.73), and small for gestational age (OR, 1.96; 95% CI, 1.61-2.39). **Study Two** The odds for preterm birth, stillbirth, and small for gestational age were higher for women that used cannabis compared with non-users (OR 1.50, 95% CI 1.09-2.05).	**Study One** **Methodological flaws:** Use of unvalidated outcomes measures and convenience sampling. **Inconsistency:** None **Indirectness:** None **Imprecision**: Only 89 participants reported moderate cannabis use and wide confidence intervals. **Publication bias:** None **Study Two** **Methodological flaws:** Use of unvalidated outcome measures, homogenous sample, ethnicity was not addressed. **Inconsistency:** None **Indirectness:** None **Imprecision:** Small number of participants (211) used cannabis in the sample. **Publication bias:** Two of the co-authors received funding for their time.

Design			Implications		
Study One Retrospective cohort study **Study Two** Retrospective cohort study			**Study One** Cannabis use during pregnancy increases the risk for delivery of infant with LBW and small for gestational age. **Study Two** Maternal cannabis increases the likelihood of infant having a stillbirth, preterm birth, or small for gestational age infant.		

Systematic Reviews

References

Daha, S. K., Sharma, P., Sah, P. K., Karn, A., Poudel, A., & Pokhrel, B. (2020). Effects of prenatal cannabis use on fetal and neonatal development and its association with neuropsychiatric disorders: A systematic review. *Neurology, Psychiatry and Brain Research, 38*, 20-26. https://doi.org/https://doi.org/10.1016/j.npbr.2020.08.008

Gunn, J., Rosales, C., Center, K., Nuñez, A., Gibson, S., Christ, C., & Ehiri, J. (2016). Prenatal exposure to cannabis and maternal and child health outcomes: A systematic review and meta-analysis. *BMJ Open, 6*(4), e009986-e009986. https://doi.org/10.1136/bmjopen-2015-009986

Purpose/Objectives	Search Strategy	Number and Type of Studies in the Review Including Sample Sizes	Results	Conclusions/ Implications	Evidence Quality
Study One To assess the impact of prenatal cannabis use on the fetal development and neuropsychiatric manifestations. **Study Two** To assess the effects of cannabis use during pregnancy on maternal and fetal outcomes.	**Study One** **Data Bases**: PubMed, Medline, Google Scholar, and PsycINFO **Search Terms**: Cannabis, Marijuana, THC, Tetrahydrocannabinol, Cannabis sativa and pregnancy **Limits**: English Language **Reviewers**: Not stated **Study Two** **Databases**: PubMed, MEDLINE, Ovid, CINAHL, PsychInfo, EBSCO, Web of Science, Sociological Abstracts, and EMBASE **Search Terms:** Broad keywords on cannabis and maternal, fetal, prenatal, and neonatal outcomes **Limits:** English language **Reviewers:** Two independent reviewers	**Study One** This systematic review included 31 studies with a total sample size of 289,055 participants. **Study Two** The review included 24 studies with a total of 10,350 participants.	**Study One** Based on the collective data from the selected articles, 84% of studies supported the evidence that maternal use of cannabis during pregnancy correlates with adverse intra-uterine fetal and childhood development. **Study Two** LBW in infants exposed to cannabis (pOR 1.77; 95% CI 1.04 to 3.01). NICU stay for infants exposed to cannabis (pOR 2.02, 95% CI 1.27 to 3.21).	**Study One:** The evidence stated the negative impact of cannabis use during pregnancy, which recommend mothers to abstain from this practice during pregnancy. **Study Two** The review found that use of cannabis during pregnancy may increase adverse outcomes. Suggestions made for increased health education and exploration of cannabis effects.	**Methodological flaws:** Heterogenicity of samples as well as use of unvalidated outcome measures. **Inconsistency:** None **Indirectness:** None **Imprecision:** Lack of supporting confidence interval or p-value to state the significance between each study. **Publication bias:** None **Study Two** **Methodological flaws:** Use of unvalidated outcome measures. **Inconsistency:** Variability of results from the included studies. **Indirectness:** None **Imprecision:** Wide confidence intervals **Publication bias:** None

Innovation Systematic Reviews

References
Bayrampour, H., Zahradnik, M., Lisonkova, S., & Janssen, P. (2019). Women's perspectives about cannabis use during pregnancy and the postpartum period: An integrative review. *Preventive Medicine, 119*, 17-23. https://doi.org/10.1016/j.ypmed.2018.12.002
Weisbeck, S. J., Bright, K. S., Ginn, C. S., Smith, J. M., Hayden, K. A., & Ringham, C. (2020). Perceptions about cannabis use during pregnancy: A rapid best-framework qualitative synthesis. *Canadian Journal of Public Health, 112*(1), 49-59. https://doi.org/10.17269/s41997-020-00346-x

Purpose/Objectives	Search Strategy	Number and Type of Studies in the Review Including Sample Sizes	Results	Conclusions/ Implications	Evidence Quality
Study One To assess women's perceptions about cannabis use during the perinatal period along with potential motives of continued and discontinued use. **Study Two** To assess women's perceptions, beliefs, and knowledge of the risks associated with cannabis use during pregnancy.	**Study One** **Data Bases**: MEDLINE, PsycInfo, EMBASE, and CINAHL **Search Terms:** Pregnancy, cannabis, perinatal care, perception, access to information **Limits:** English language and non-gray literature **Reviewers:** Two independent reviewers **Study Two** **Databases:** Ovid MEDLINE, Epub Ahead of Print, EMBASE, PsycINFO, and CINAHL **Search Terms:** Cannabis, perinatal, health knowledge, and attitude to health **Limits:** English language articles on human subjects **Reviewers:** Two independent reviewers	**Study One** The review included 6 studies with a total of 21,793 participants. **Study Two** The review included 5 studies with a total of 10,010 participants.	**Study One** The perception gestational cannabis use does no harm has increased by 3-fold from 2005-2015. Continued use of cannabis prenatally were less likely to believe that cannabis could be harmful during pregnancy than those who quit (26% vs. 75%, respectively). Internet was the main source of information. Most women reported not receiving counseling about cannabis use from their providers or focused on legal consequences. **Study Two** The finds of these studies were supported and synthesized using the Priori framework. A total of 8 common themes were identified. There were many different aims, measures, and findings. This precluded statistical analysis.	**Study One:** The perceived safety of cannabis use during pregnancy is increasing. There is a lack of patient education on the topic. A discussion about health concerns associated with perinatal cannabis use may influence a women's perception of potential risks and help them make an informed decision. **Study Two** The use of perinatal cannabis use is increasing along with its perceived safety. There is a lack of patient-provider communication on the topic. There is a push for increased unbiased education on the topic to promote informed decisions.	**Study One** **Methodological flaws:** Use of unvalidated outcomes measures. **Inconsistency:** None **Indirectness:** Interviewed a mixture of participants in both legalized and non-legalized states; mixture of pregnant and non-pregnant. **Imprecision:** None **Publication bias:** None **Study Two** **Methodological flaws:** Use of unvalidated outcomes measures, Heterogeneity of sample. **Inconsistency:** Variability of results from the included studies. **Indirectness:** Interviewed a mixture of participants in both legalized and non-legalized states. **Imprecision:** Lack of supporting confidence interval or p-value. **Publication bias:** None

Appendix B
Recruitment Flyer

Perinatal Education

Pregnancy and Cannabis

Join us for a presentation on

The effects of using cannabis during pregnancy and how it may effect your baby long-term

Osceola Pregnancy Center

Date: **April 14, 2023** and **June 16, 2023**
Time: 1pm

Register via QR Code:
or
Walk-ins welcomed

Presentation by AdventHealth University Students:
Danielle Smith
Harlie Miller
Taylor Crum

For more information, contact pregnancy.edu@outlook.com

Appendix C
Participation Agreement

Notificación del acuerdo de participación voluntaria

Título del proyecto académico: Uso materno de cannabis y desarrollo infantil

Nombre completo de la investigadora principal (IP): Dra. Sarah Snell

Nombres completos de las subinvestigadoras: Harlie Miller, Taylor Crum y Danielle Smith

A quien corresponda,

Somos alumnas de AdventHealth University (AHU, por sus siglas en inglés) haciendo un doctorado en enfermería anestesista. Lo invitamos a participar en nuestro proyecto académico. El propósito de este proyecto es educar a las mujeres sobre los efectos del uso de cannabis durante el embarazo. Este es un tema preocupante en Florida debido a que su uso medicinal fue recientemente aprobado y a la falta actual de recursos disponibles para las mujeres.

Si elige participar, se le pedirá que haga una prueba preliminar que consiste en un cuestionario electrónico de 10 preguntas. A continuación, habrá una presentación de PowerPoint de 20 minutos y por último, se le pedirá que complete una prueba posterior idéntica de 10 preguntas. El tiempo total requerido será de unos 50 minutos. Nuestro objetivo es concientizar y medir el éxito de nuestra enseñanza.

Usted no recibirá pago ni obsequios de los investigadores. Sin embargo, recibirá puntos de incentivo del Osceola Pregnancy Center (OPC, por sus siglas en inglés). Usted se compromete a realizar todas las actividades relacionadas con este proyecto.

Este proyecto es voluntario y usted puede optar por abandonarlo en cualquier momento. Si ya no desea participar, informe a los investigadores. Su decisión no afectará la obtención de los puntos de incentivo ni su atención en el OPC.

Su participación será de carácter confidencial. Sin embargo, existe una posibilidad pequeña e improbable de que su información pueda ser vulnerada. Se han tomado medidas para disminuir este riesgo mediante el uso de plataformas confiables como Microsoft. Además, no se solicitará su nombre durante la recopilación de datos.

Estos resultados se compartirán para contribuir con la educación futura relacionada al embarazo. Los resultados de este proyecto serán compartidos con los directivos de OPC y AHU.

Si tiene preguntas, inquietudes o quejas, comuníquese con el equipo a través del correo electrónico pregnancy.edu@outlook.com

He leído toda la información y me la han explicado en detalle. He tenido la oportunidad de hacer preguntas. Doy mi consentimiento de forma voluntaria para participar en este proyecto.

_____

Nombre del participante en imprenta

_____   _____

Firma del participante (requerida)   **Fecha: Día / Mes/ Año**

Notice of Voluntary Participation Agreement

Title of the scholarly project: Maternal Cannabis Use and Childhood Development

Principal Investigator (PI) full name: Dr. Sarah Snell

Sub-investigators full names: Harlie Miller, Taylor Crum, and Danielle Smith

To Whom It May Concern,

We are students at AdventHealth University (AHU), obtaining a doctorate degree in nurse anesthesia. We invite you to participate in our scholarly project. The purpose of this project is to educate women on the effects of cannabis use during pregnancy. This is a concern in Florida due to its recent medical approval and the current lack of resources available to women.

If you choose to participate, an electronic 10-question pretest will be given to you. To follow, there will be a 30-minute PowerPoint presentation. Lastly, an identical 10-question posttest will be issued. The total time required will be about 50 minutes. Our goal is to spread awareness and measure the success of our education.

You will not receive payment or gifts from the Investigators. However, you will receive incentive points from the Osceola Pregnancy Center (OPC). You agree to perform all duties related to this project.

This project is voluntary, and you can choose to quit at any time. If you no longer wish to participate, please inform the Investigators. Your decision will not affect you receiving incentive points or your care with the OPC.

All data will be securely stored and remain confidential. This information will not be linked to you personally. These results will be shared to help with future pregnancy-related education. The results of this project will be shared with the OPC leadership and AHU.

If you have questions, concerns, or complaints, please reach out to the team at
pregnancy.edu@outlook.com

I have read all of the information, and it has been explained in detail. I have had the chance to ask questions. I consent voluntarily to be a participant in this project.

_____

Printed Name of Participant

_____   _____

Signature of Participant (required)   **Date   Day / Month/ Year**

Appendix D
Questionnaire with Rationales

Maternal Cannabis Use and Childhood Development
Pretest/Posttest Multiple Choice Questions

Objective # 1: Upon completion of a 20-minute educational lecture on maternal cannabis use and childhood effects, OPC participants will be able to identify one microorganism and one heavy metal associated with cannabis.

1. **Which heavy metal is found in cannabis?**
   a. Cobalt
   b. Copper
   c. Iodine
   d. Lead

Correct Answers: D

Rationale: Lead is one of the heavy metals that has been found when analyzing cannabis samples (Dryburgh et al., 2018).
Distractors include copper, iodine, and cobalt. Although these materials are considered heavy metals by nature, they have not been noted in the literature to be commonly found in cannabis. These answer choices require the reader to stop and think more in-depth about the question being asked.
Educational PowerPoint reference: Slide 3

2. **Which microorganism causes infections in cannabis users?**
   a. COVID-19
   b. E. Coli
   c. Salmonella
   d. Tuberculosis

Correct Answer: C

Rationale: Pathogenic microbial species isolated from cannabis preparations can result in infections and present a potential outbreak risk. There have been reports of an outbreak of *Salmonella enteritis*, which was traced back to cannabis harboring the bacteria (Dryburgh et al., 2018).
Distractors include COVID-19, E. Coli, and tuberculosis. Although these are microorganisms they have not been directly linked to cannabis use.
Educational PowerPoint reference: Slide 3

Objective # 2: Upon completion of a 20-minute educational lecture on maternal cannabis use and childhood effects, OPC participants will be able to identify two physiological effects on the child.

3. **Which early childhood physical effects are associated with maternal cannabis use?** (Select 2.)

a. Large size for age
b. Later delivery
c. Low birth weight
d. Intensive care admission

Correct Answers: C & D

Rationale: Low birth weight and neonatal intensive care unit (NICU) admission <u>are</u> supported throughout the literature as being associated with in-utero cannabis exposure (Fergusson et al., 2002; Gunn et al., 2015; Nguyen & Harley, 2021; Rodriguez et al., 2019; Warshak et al., 2015). **Distractors** include large size for age and later delivery. The literature does not support an association between large for gestational age and post-term delivery with in-utero cannabis exposure. However, in-utero cannabis exposure has been linked to shorter infant birth lengths and small for gestational age (Fergusson et al., 2002). This question prompts the reader to pause and give more thought to the question as it requires recalling multiple adverse physical outcomes.
Educational PowerPoint reference: Slide 7

<u>Objective # 3:</u> Upon completion of a 20-minute educational lecture on maternal cannabis use and childhood effects, OPC participants will be able to identify one psychological effect on the child.

4. **Which effect on a child's mental state is linked to maternal cannabis use?**
    a. High achievements
    b. High IQ scores
    c. Increased focus
    d. Sleep disturbances

Correct Answer: D

Rationale: The literature suggests that gestational cannabis use has been associated with increased sleep disturbances in comparison to non-exposed children (Daha et al., 2020; Marroun et al., 2011; Paul et al., 2021).
Distractors include an increased focus, high achievements, and higher IQ. These variables have not been associated with in-utero cannabis exposure. However, it has been linked to a decreased level of focus and lower IQ levels, thus hindering the child's academic achievements (Daha et al., 2020; Marroun et al., 2011; Paul et al., 2021).
Educational PowerPoint reference: Slide 8

<u>Objective #4:</u> Upon completion of a 20-minute educational lecture on maternal cannabis use and childhood effects, OPC participants will be able to identify two alternative treatments to relieve morning sickness.

5. **What alternative can help reduce nausea during pregnancy?**
    a. Aromatherapy
    b. Large meals

  c. Limited water intake
  d. Spicy foods

Correct Answer: A

Rationale: The utilization of aromatherapy has been shown to help some women subside symptoms of nausea. The use of peppermint and lavender essential oils may be used to treat nausea during pregnancy (Sisco, 2016; Smith et al., 2022).
Distractors include limited water intake, consuming a large meal, and spicy foods. These behaviors are discouraged as they may provoke symptoms of nausea (American Pregnancy Association, 2021; Smith et al., 2022).
Educational PowerPoint reference: Slides 9 and 10

6. **Which therapy is MOST likely to help with nausea during pregnancy?**
  a. Acupuncture
  b. Cupping
  c. Excessive exercise
  d. Hot Yoga

Correct Answer: A
Rationale: Therapies such as acupuncture, hypnosis, and psychotherapy have been shown to alleviate symptoms of nausea. The antiemetic effects of acupuncture inhibit the chemoreceptor trigger zone and vomiting center in the brain (Sahin et al., 2022)
Distractor includes excessive exercise, cupping, and hot yoga as these are not recommended in the literature to reduce nausea.
Educational PowerPoint reference: Slide 10

Objective #5: Upon completion of a 20-minute educational lecture on maternal cannabis use and childhood effects, OPC participants will be able to identify one organization that provides pregnancy recommendations related to cannabis use.

7. **Which organization recommends avoiding the use of cannabis during pregnancy?**
  a. American Academy of Cosmetic Surgery
  b. American College of Obstetricians and Gynecologists
  c. American College of Surgeons
  d. American Geriatrics Society

Correct Answer: B

Rationale: Cannabis use has been linked to adverse physiological and psychological effects on the child. Therefore, the American College of Obstetricians and Gynecologists has recommended the cessation of cannabis use throughout pregnancy to reduce the risk of fetal exposure (The American College of Obstetricians and Gynecologists, 2018).
Distractors include the American Academy of Cosmetic Surgery, American College of Surgeons, & American Geriatrics Society as they do not provide recommendations on this topic.

Cessation of cannabis use is recommended throughout the entire pregnancy and during periods of breastfeeding (The American College of Obstetricians and Gynecologists, 2018).
Educational PowerPoint reference: Slide 5

Objective #6: Upon completion of a 20-minute educational lecture on maternal cannabis use and childhood effects, OPC participants will be able to identify one medical condition associated with chronic cannabis use.

8. **Chronic cannabis use has been linked to which condition in women?**
    a. Better mental health
    b. High blood pressure
    c. Severe nauseous state
    d. Severe weight loss

Correct Answer: C

Rationale: Chronic cannabis use causes the downregulation of CB-1 receptors along with the accumulation of toxins. This mechanism increases the risk of developing cannabinoid hyperemesis syndrome during pregnancy (Davidson et al., 2020).
Distractors include better mental health, high blood pressure, and severe weight loss. This substance causes side effects that may have negative effects on the fetus and are not recommended to use during pregnancy (CDC, 2018; The American College of Obstetricians and Gynecologists, 2018). Additionally, cannabis increases the risk of moms having mental health disorders such as anxiety, depression, bipolar disorder, substance use disorders, post-traumatic stress disorder, and insomnia (Barbosa-Leiker et al., 2020).
Educational PowerPoint reference: Slide 5 and 6

Objective #7: Upon completion of a 20-minute educational lecture on maternal cannabis use and childhood effects, OPC participants will be able to identify two anesthesia-related problems associated with chronic cannabis use.

9. **Which anesthesia-related problem is linked to chronic cannabis use?**
    a. Decreased anesthesia requirements
    b. Delayed wound healing
    c. Increased pain scores
    d. Increased risk of infections

Correct Answer: C

Rationale: Chronic cannabis use is linked to increased pain scores after surgery. Chronic cannabis users have a higher metabolism and are prone to requiring more anesthetic agents and analgesic requirements in the postoperative period to obtain an adequate level of comfort (Alexander & Joshi, 2019; Horvath et al., 2019; Wiseman et al., 2022).
Distractors include decreased anesthesia requirements, delayed wound healing, and increased risk of infections. The literature does not support an association between chronic cannabis use and increased infection rates or delayed wound healing. However, chronic cannabis use has been

linked to increased anesthetic requirements (Alexander & Joshi, 2019; Horvath et al., 2019; Wiseman et al., 2022).
Educational PowerPoint reference: Slide 12

10. Chronic cannabis use is associated with which pregnancy-related outcome?
    a. Decreased contractions
    b. Increased risk for c-section
    c. Rapid cervical dilation
    d. Sterility

Correct Answer: B

Rationale: Chronic cannabis use has been linked with an increased risk for cesarean sections compared to non-users (Sasso et al., 2021).
Distractors include decreased contractions, rapid cervical dilation, and sterility. There is no direct correlation between sterility and progression of labor to in-utero cannabis exposure. However, chronic cannabis use has been linked to low sperm count and poor intrapartum pain management (Srinivasan et al. 2021; Horvath et al., 2019).
Educational PowerPoint reference: Slide 11

Appendix E
Budget and Verification of Costs

Materials	Reference	Cost per Unit	Time or Quantity	Estimated Cost	Total Cost
Translation of Education Material	https://www.clarivita.com/	$0.15/word	1200 words	$180.00	$130.46
Translation of PowerPoint Presentation	https://www.clarivita.com/	$0.15/word	600 words	$90.00	$50.00
In-Person Translation Services	https://www.clarivita.com/	$120.00/hr	2 hours per session	$480.00	$320.00
Printer Paper	https://www.staples.com/Staples-Copy-Paper-Select-8-1-2-x-11-500-Ream-Each-20471-US/product_897804	$8.29/500 page ream	1 ream	$8.29	$8.49
Printer Ink: Black & Multicolor	https://www.staples.com/hp-61xl-61-black-high-yield-tri-color-standard-yield-ink-cartridges-2-pack-cz138fn-vb/product_24463447v	$76.88/2 cartridge pack	1 package	$76.88	$64.95
Total				$835.17	$573.90

Appendix F
Project Timeline

November 2022
Submitted proposal plan to the Institutional Review Board and SRC for a non-research designation for an evidence-based project initiative.

Spring/Summer 2023
Conducted scheduled weekday evening educational sessions monthly from April to July 2023.

Fall 2023 - Spring 2024
Complete project poster board and provided evidence-based recommendations to OPC.

Spring 2023
Began recruitment at the OPC for project participants.

Fall 2023
Completed data analysis with the assistance of AdventHealth University's statistician.

Spring 2024
Dissemination will ensue at AdventHealth University (AHU) in Orlando, FL, to faculty and peers.